

The above description and drawings are only illustrative of preferred embodiments which can achieve and provide the objects, features and advantages of the present invention. It is not intended that the invention be limited to the embodiments shown and described in detail herein. Modifications coming within the spirit and scope of the following claims are to be considered part of the invention.

What is claimed as new and desired to be protected by Letters Patent of the United States is:

Sub B 1. A mold apparatus for producing molded optical elements, said apparatus comprising:

a first mold unit for defining mold cavities and flow passageways; and

a second mold unit having a mold surface for sealing against said first unit, said mold surface containing a plurality of patterns for molding optical patterns in the optical elements.

2. The mold apparatus of claim 1, further comprising a mechanism for moving said first unit toward said second unit to form said flow passageways.

Sub C 3. The mold apparatus of claim 2, further comprising mold pins for defining said mold cavities, said mold pins being located in said first mold unit.

Sub A 4. The mold apparatus of claim 3, wherein said first mold unit has a front face opposed to said mold surface of said second mold unit, and wherein said mold passageways are formed in said front face.

Sub C 5. The mold apparatus of claim 1, wherein said first mold unit is removable, and wherein said apparatus is arranged to receive other first mold units to produce products of different sizes and shapes.

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6. The mold apparatus of claim 1, wherein said second mold unit includes a flat metal puck covering said mold cavities and said flow passageways.

Sub C3

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7. The mold apparatus of claim 6, further comprising means for removing said metal puck, such that other pucks may be installed in said apparatus to produce products having different optical characteristics.

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8. The apparatus of claim 7, wherein said patterns include micro-refractive patterns.

9. The apparatus of claim 7, wherein said patterns include diffraction patterns.

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10. A method of making molded optical elements, said method comprising the steps of:

providing a metal puck with a plurality of optical patterns;

locating said metal puck against a mold surface to form mold cavities and flow passageways; and

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subsequently, molding optical elements within said mold cavities such that said optical patterns of said metal puck are formed in said optical elements.

11. The method of claim 10, further comprising the step of moving said mold surface toward said metal puck to form said flow passageways.

5 *Sub C4* 12. The method of claim 11, further comprising the step of using mold pins to define the thicknesses of said mold cavities.

13. The method of claim 12, further comprising the step of flowing molten resin across said mold surface in radial directions toward said cavities.

10 14. The method of claim 13, further comprising the step of using said metal puck to enclose said flow passageways.

15 *Sub C5* 15. The method of claim 10, further comprising the steps of separating said mold surface from said metal puck, and locating another mold surface against said metal puck to form different size mold cavities.

20 16. The method of claim 10, further comprising the steps of separating said puck from said mold surface, and providing another metal puck having patterns formed therein to form optical elements having different optical characteristics.

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17. A method of making a mold apparatus, said method comprising the steps of:

forming a plurality of optical patterns in a single metal puck;

locating said metal puck against a mold unit to form mold cavities and

5 flow passageways; and

locating mold pins in said mold unit to define the thicknesses of said mold cavities.

10 18. The method of claim 17, wherein said step of forming said patterns includes the step of using an analog gray scale mask to pattern photoresist material.

15 19. The method of claim 17, wherein said step of forming said patterns includes ion milling.

20. The method of claim 17, wherein said step of forming said patterns includes electron beam lithography.